

NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

Reuse Working Group

Co-chairs:

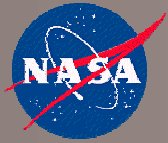
Robert Wolfe, NASA GSFC

Vic Delnore, NASA LRC

4th Earth Science Data Systems Working Group Meeting

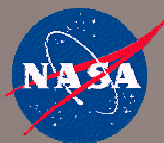
Baltimore, MD

October 25 - 27, 2005



Agenda

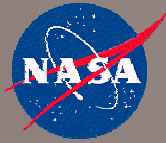
-
- Activities & Accomplishments
 - Summary of Activities
 - Recommendations to Headquarters
 - Policy
 - Reuse Survey
 - Reuse Portal
 - Trade Study
 - Breakout Session Agenda



NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

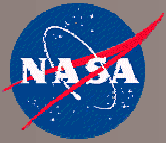
Working Group Members 2005

Bill Teng	NASA GSFC DAAC	Muhammed Rabi	NASA GSFC – ECHO (GST)
Bob Harberts	NASA GSFC – ECHO (GST)	Nancy Casey	NASA GSFC (SSAI)
Bruce Barkstrom	NASA LRC	Pat Moran	NASA ARC
Bruno Margerin	NASA GSFC	Quincey Koziol	NCSA
Castalia Bradford	Arizona, University of	Robert R. Downs	Columbia University
Chris Linnus	NASA GSFC	Robert Wolfe	NASA GSFC
Christopher Justice	University of Maryland	Robin Pfister	NASA GSFC
Clyde Brown	NASA LRC	Ross Swick	NSIDC – Boulder
David Giles	NASA GSFC (SSAI)	Rudolf Husar	Washington University in St. Louis
David Isaac	BPS	Ruth Neilan	NASA JPL
Edward Masuoka	NASA GSFC	Ryan Gerard	NASA GSFC (Innovim)
Emily Greene	Raytheon	Scott Lewicki	NASA JPL
Fred Brosi	GST	Shahin Samadi	NASA GSFC (Innovim)
Fredrick Watson	State University of California	Stefan Falke	Washington University in St. Louis
Glen Schuster	US Satellite Lab	Steve Kempler	NASA GSFC DAAC
Howard Burrows	AUSI/NSDL	Steve Olding	NASA GSFC (Everware)
James Marshall	NASA GSFC (Innovim)	Steven Ackerman	University of Wisconsin
John Evans	NASA GSFC (GST)	Thomas P. Yunck	NASA JPL
Keith Wichmann	NASA GSFC – ECHO (GST)	Tommy Jasmin	University of Wisconsin
Kyle Millwe	NASA JPL – MISR	Victor Delnore	NASA LARC
Meixia Deng	GMU	Watson Gregg	NASA GSFC
Michael Little	NASA LRC	Yonsook Enloe	NASA GSFC (SGT Inc.)
Mike Folk	National Center for Supercomputing Applications	Zhong Feng	GST



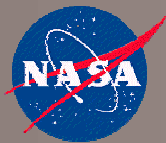
2005 Activities Summary

- Conducted monthly full working group telecons & weekly team telecons
- Presented posters
 - ESIP Federation (January 2005, DC)
 - ESIP Federation (June 2005, San Diego)
 - AGU (May 2005, New Orleans)
 - Abstracts also accepted for December 2005 AGU
- Workshop at August ESIP Federation meeting
- Presented reuse recommendations to NASA HQ
- Developed policy recommendations
- Conducted 2nd phase of reuse survey
- Developed reuse portal
- Conducted trade study of reuse catalogs & repositories



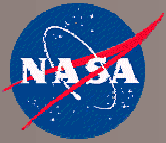
NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

Recommendations to Headquarters



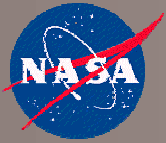
Recommendations to Headquarters

- Policy Recommendations
 - NASA should develop standard language for use in future procurement and grant notices that will encourage more software reuse
 - NASA should adopt a policy of releasing its Earth science software to the community using the NASA Open Source Agreement
- Enabling Systems Recommendations
 - NASA should establish a Web-based information portal for the sharing and dissemination of information about software reuse practices for the Earth science community
 - NASA should establish a system to facilitate the cataloging and distribution of reusable assets for the Earth science community



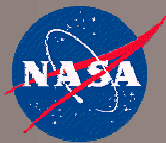
NASA HQ Response

- Policy Recommendation 1
 - Propose that nascent language developed for the REASoN CAs and draft system software policy be a starting point
 - Reuse WG has the expertise to develop draft language and provide to HQ (i.e., Martha Maiden– Data Systems Program Executive)
 - Data Systems Program Executive will work with NASA Legal to finalize appropriate language
 - Upon concurrence by Headquarters SMD Management, appropriate language will be included in ROSES (Earth Science) announcements
- Policy Recommendation 2
 - For system software, NASA considers Open Source as one of a number of solutions to achieve effective lifecycle costs and appropriate design. Alternatively NASA may opt to assign copyright to NASA or its designee to foster commercial development.
 - REASoN CA Data Rights (slide 8) states that proposals must document intent to commercialize system software upfront or software can be made available without restriction by NASA
 - HQ agrees that the process for release software to open source should be improved and applauds the Reuse WG
 - NASA seeks recommendation from the Reuse WG on how to facilitate and release software for Open Source



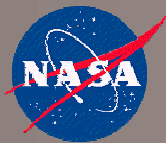
NASA HQ Response

- Enabling Systems Recommendation 1
 - Encourage the continued development of the <http://softwarereuse.nasa.gov> web site
 - Undertake a trade study to understand the roles of NASA Open Source Agreement web site (<http://opensource.arc.nasa.gov>), the role of GCMD in cataloging data services, and any other related NASA software sites
- Enabling Systems Recommendation 2
 - HQ thinks such a recommendation is premature and needs to await the results of a trade study concerning the establishment of a reuse portal (Enabling System 1)



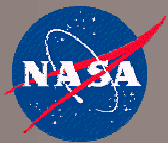
NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

Policy



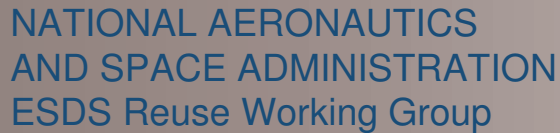
Policy Activities

-
- Provided feedback to Headquarters on “Draft Policy for System Software Acquisition for NASA Data System Solicitation”
 - Provided feedback to Headquarters on proposed changes to NPD 2210.1B (External Release of NASA Software)
 - Developed draft language for future grant / procurement RFPs that addresses software reuse and open source software
 - for possible inclusion in ROSES (Earth Science) announcements
 - Liaison with Office of Technology Transfer



NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

Reuse Survey



ESE Software Reuse Questionnaire - Microsoft Internet Explorer provided by Global Science & Technology, Inc.

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print View Source Options

Address http://vista-survey.com/survey/v1/dscript

Google Search Web 86 blocked AutoFill Options

Over the last five years, how often have you (or your project) reused the following types of software development artifacts?

	1 (Never)	2 (Rarely)	3 (Sometimes)	4 (Often)	5 (Very Often)
a) Algorithms , Techniques	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) Designs, Architectures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) Source code, Scripts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) Executables, Binaries	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>


ESE Software Reuse Questionnaire - Microsoft Internet Explorer provided by Global Science & Technology, Inc.

File Edit View Favorites Tools Help

Back Forward Stop Search Favorites Media Print View Source Options

Address http://vista-survey.com/survey/v1/dscript

Google Search Web 86 blocked AutoFill Options

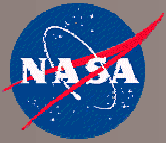


28% Done

Recent Reuse Experiences

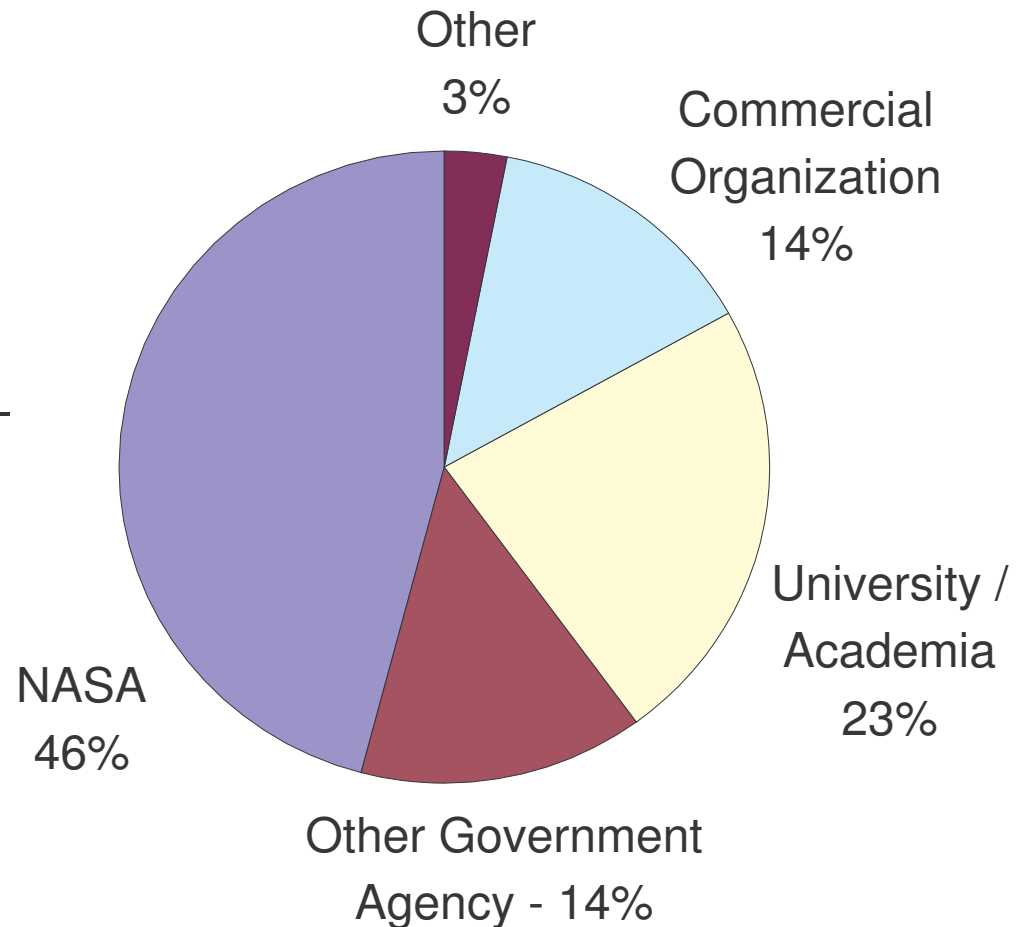
For any of the newly written software, was there software from another source that might have provided *any* of the capabilities needed? If so, how important were the following factors in preventing you from reusing that software?

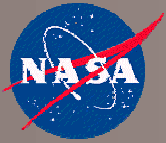
	1 (Not important at all)	2 (Not very important)	3 (Somewhat important)	4 (Important)	5 (Very important)
a) I didn't know other software existed at the time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) Other software wasn't compatible with my system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) Other software didn't exactly match my requirements	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) Other software was difficult to understand or poorly documented	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) Other software was too complex or difficult to adapt to my needs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
f) It was hard to overcome licensing restrictions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
g) I needed the source code and it wasn't available	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
h) I preferred to have the development take place within my project or wanted the experience of developing the needed capability	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
i) I didn't like how the other software was designed/implemented	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
j) Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Reuse Survey 2005

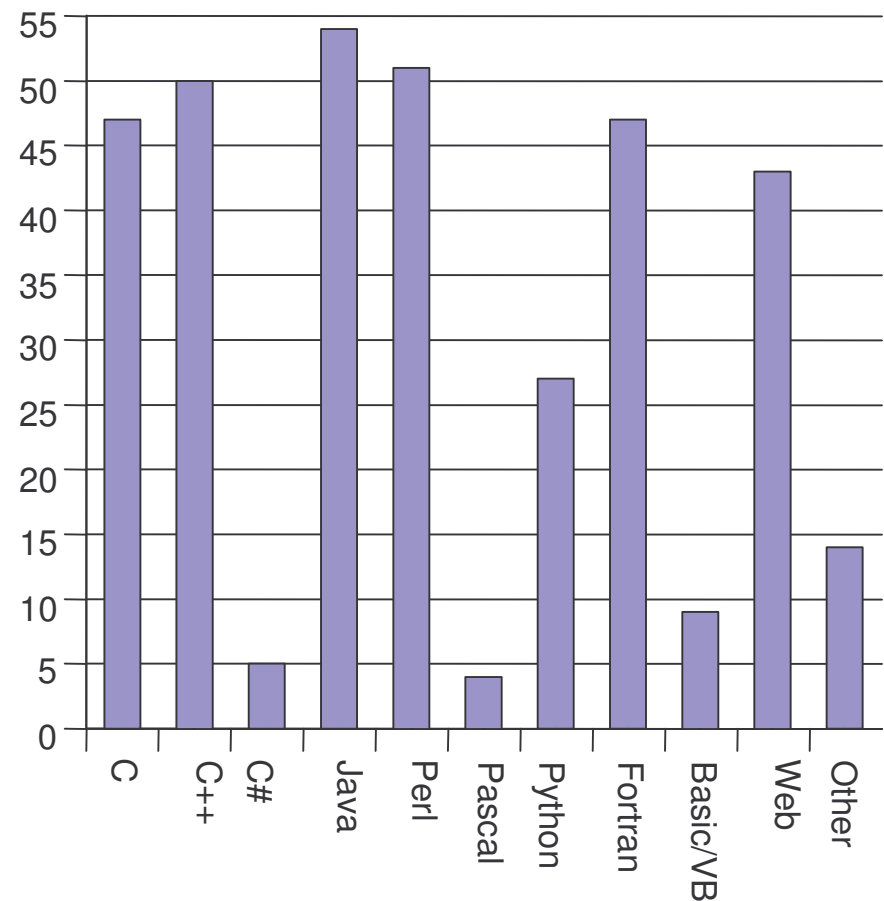
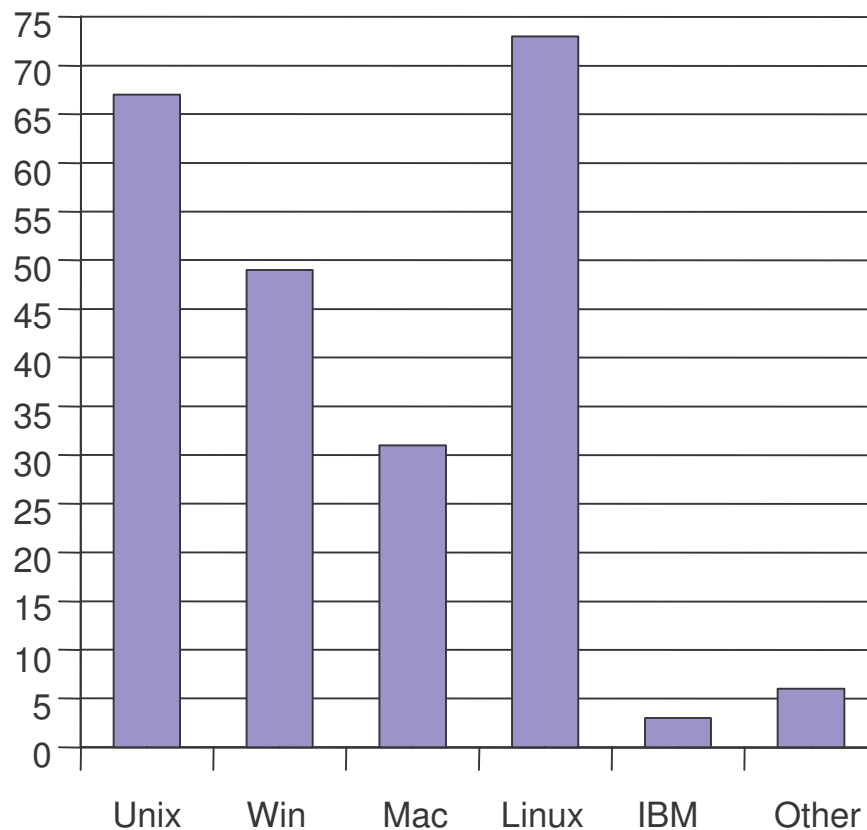
- OMB approval obtained 01/04/2005 (Approval No. 2700-0117)
- Approximately 3000 invitations issued
- Second phase survey closed on July 26, 2005
- Larger sample size than 2004 - 100 responses
- More diverse set of respondents (includes non-government)

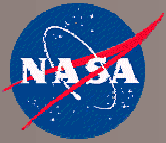




Technical Environment

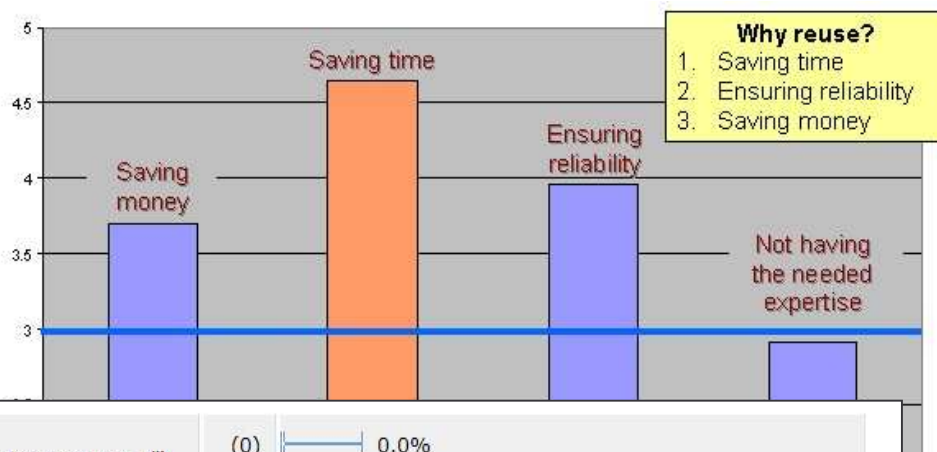
- Which Operating System(s) do you currently use or plan to use... ?
- Which programming language(s) do you currently use or plan to use... ?



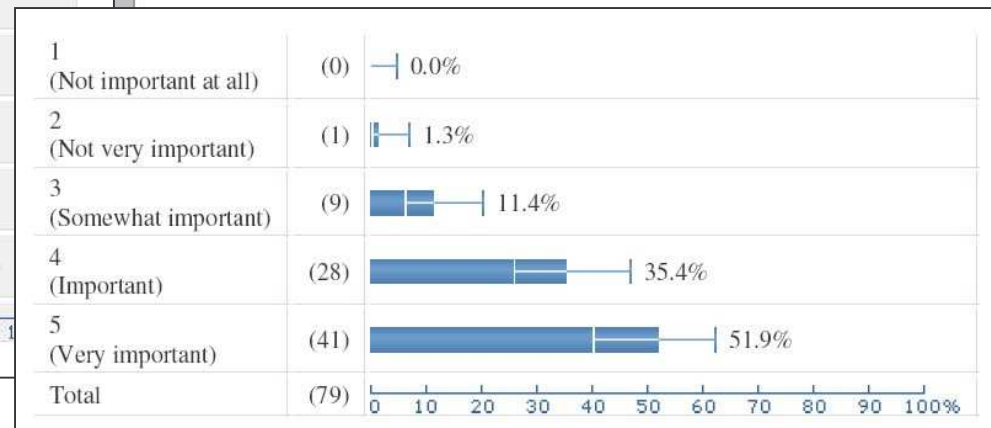


Survey Findings

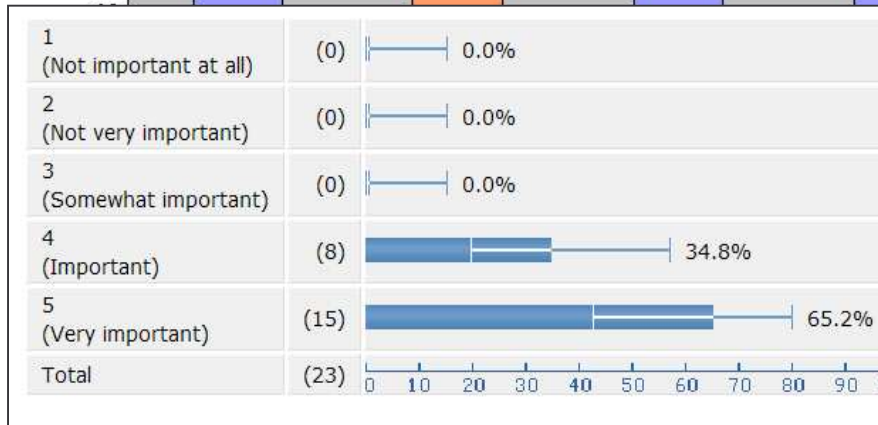
- Confirms many of the findings of 2004 survey
- Some minor differences but generally not statistically significant
- Saving time is still ranked as the primary motivation for reuse

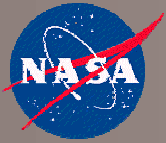


Saving time - 2005 Results



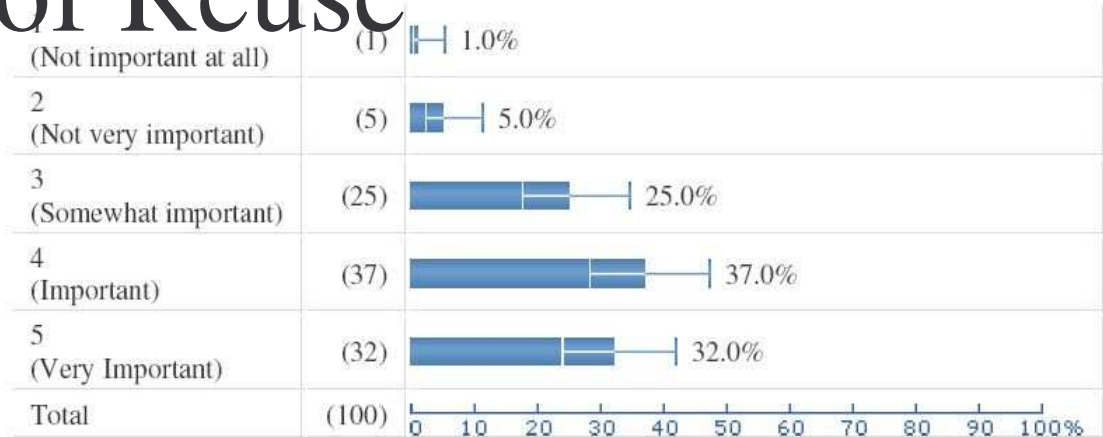
Saving time - 2004 Results



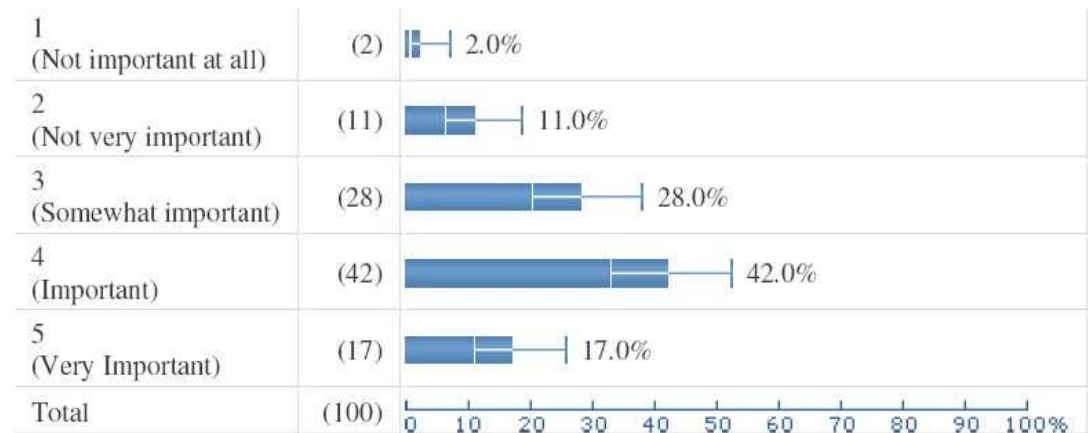


Increasing the Level of Reuse

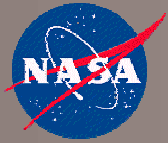
- Earth science catalog / repository seen as most important factor for increasing the level of reuse
 - 69% rated as important or very important
- Education/guidance on reuse also rated highly
 - 59% rated as important or very important
- Standardized support policy for reused software (**not shown**) also seen as important



Earth science catalog/repository for reusable artifacts

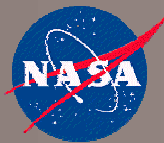


Education/guidance on reuse



NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

Reuse Portal



- The reuse portal is being developed to:
 - Raise awareness of software reuse within the Earth science community,
 - Establish a platform for community members to share/exchange resources with each other,
 - Be the gateway for reuse information relevant to the community,
 - Make access to reuse resources easier, and
 - Become the major starting site for reuse within the community

soft
OV

Home

Software Reuse

Welcome to the Earth Science Data System Software (ESDS) Reuse Portal. Please visit the public [ESDS Working Groups home page](#) for more information.

Software reuse can help the science community by reducing software development timescales, reducing costs, and contributing to the dissemination of knowledge and expertise. This Software Reuse Portal has been established by the Reuse Working Group to bring together a collection of resources that will facilitate reuse within the Earth science community. Over the next few months we will be researching a variety of resources in the Earth and Space Science reuse community. Our long-term goal is to establish a knowledge sharing community for software reuse in Earth science and, possibly, to establish a "marketplace" for reusable software development artifacts.

We have completed our survey to better understand the practice of software reuse within the Earth Science community. Results will be published in the near future.

For more information, please visit our [News](#), [Site Map](#), [About Us](#), and/or [Contact](#) page.

Developing an internal marketplace for reusable software development artifacts

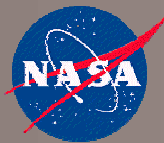
Supply
Increase the supply and availability of reusable assets

Demand
Demonstrate the feasibility and value of reuse through focused projects
Increase community capacity and desire (knowledge & tools) to reuse existing assets

Marketplace Enablement
Remove existing barriers to reuse
Establish incentives to offset artificial/structural barriers to reuse

It should be as easy to find a good quality reusable software asset as it is to find a book on the internet

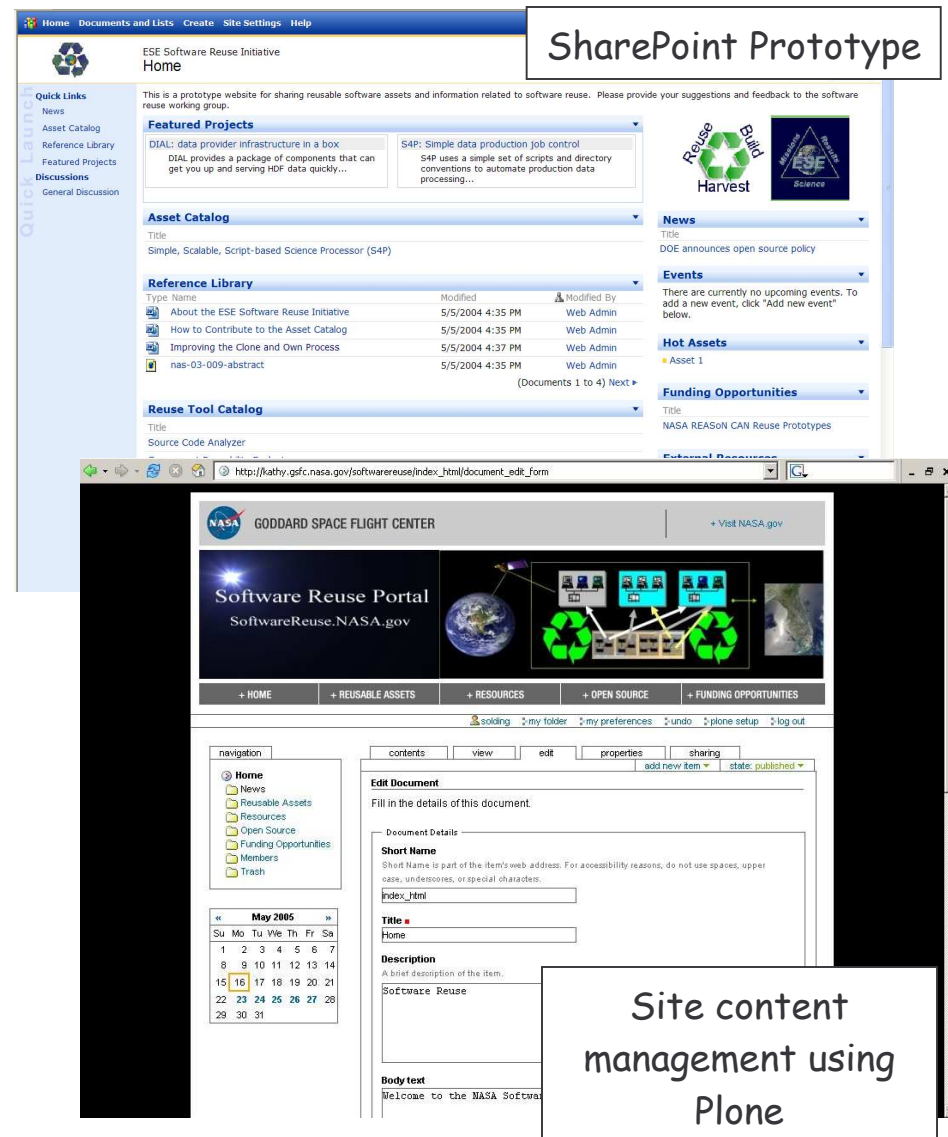
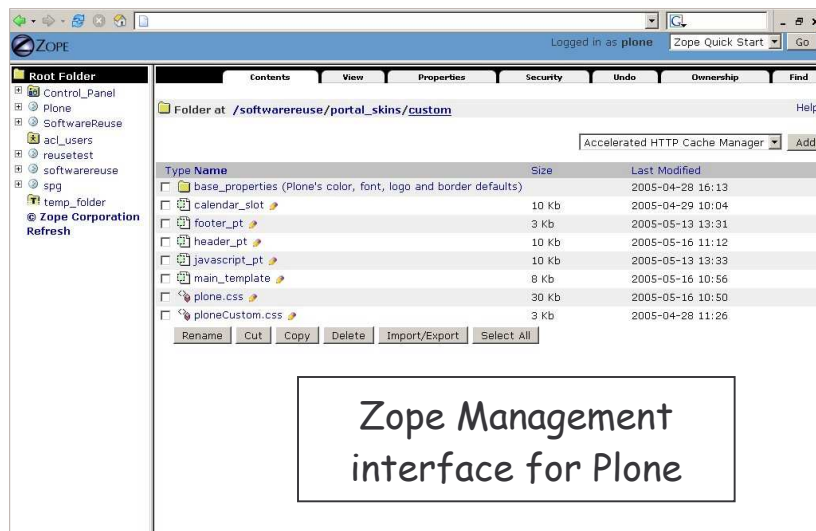
Created by [plone](#)
Last modified 2005-08-05 01:30 PM

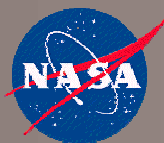


NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

Reuse Portal

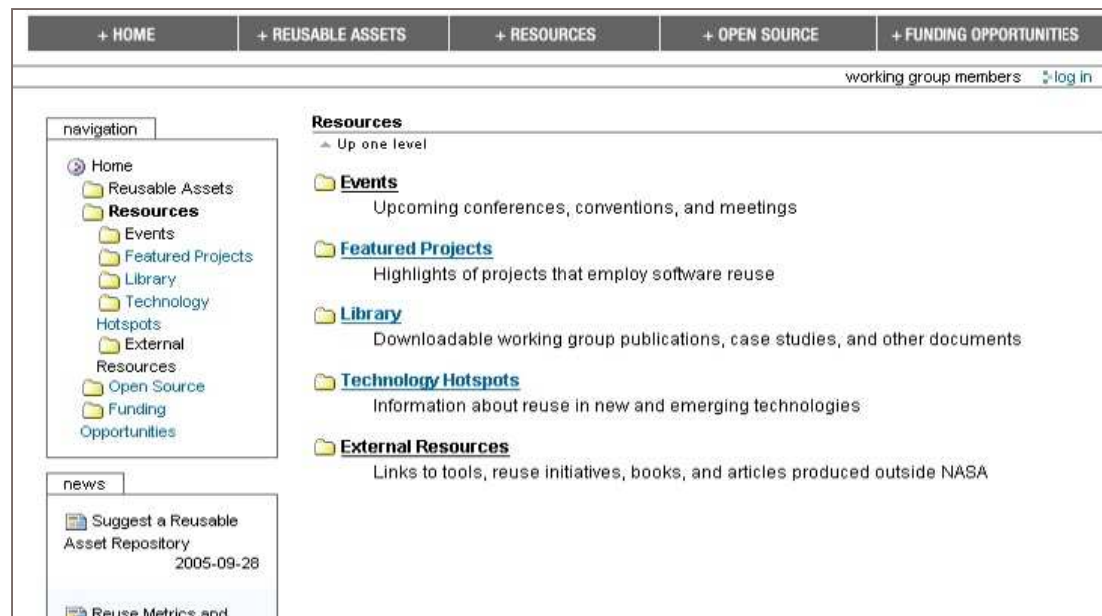
- Initial prototype of the portal created using Microsoft SharePoint
- Live version uses Plone
 - Open source content management system, running on Linux
 - Update content using a simple browser based interface
- NASA Portal Affinity - consistent NASA look and feel
- First web site to use the new DSWG server (kathy.gsfc.nasa.gov)



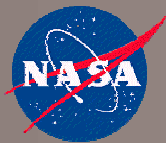


Portal Content Status

- Home/News ☒☒☒
 - latest news and information
- Reusable Assets ☒☒☐
 - links to various catalogs (e.g., GCMD, OTT Open Source)
- Open Source ☒☒☐
- Funding Opportunities ☐☐☐
 - information about funding opportunities for reuse

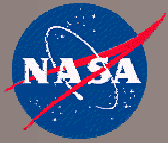


- Resources (overall) ☒☐☐
 - Events ☒☒☒
 - Featured Projects ☐☐☐
 - Library (working group documents) ☒☐☐
 - Technology Hotspots ☐☐☐
 - External Resources (links to external books and papers) ☒☐☐



NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

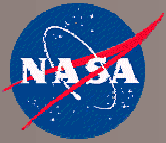
Trade Study



NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

Trade Study Background

- Enabling Systems Recommendations
 - NASA should establish a system to facilitate the cataloging and distribution of reusable assets for the Earth science community
- NASA Headquarters tasked the Working Group to look at the roles of the GCMD, Open Source Agreement site, and other sites in serving the community and meeting reuse needs.
 - Ensure that there are no existing systems that already fulfill the role proposed by the reuse working group for a reuse enablement system



System

Requirements

- Specific functional requirements identified from use cases for the system include:

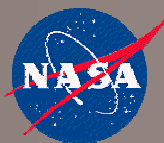
- Register User
- Contribute/Update Assets
- System Feedback
- Automatic Notifications
- Discovering Assets
- Register Asset Usage
- Asset Review
- Monitoring Feedback
- Workflow Management
- Capture Asset Needs
- Catalog or Repository

- Additional functional requirements include:

- Minimal Operation Support
- Performance
- Security
- Technology

- Important non-functional requirements include:
 - Domain (Earth science focus)
 - Type of assets provided (should include small sized components)

Requirements developed by the 2004
Support & Enablement sub-team

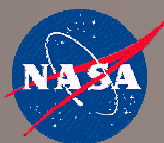


NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

NASA Systems Summary

<i>Requirement / Feature</i>	<i>Global Change Master Directory (GCMD)</i>	<i>GSFC Open Source Site</i>	<i>Ames Open Source Site</i>	<i>HDF-EOS Tools and Information Center</i>	<i>Computational Technologies Project</i>	<i>Earth Observing System Clearinghouse (ECHO)</i>	<i>Planetary Data Systems Software Download</i>
Domain	Earth science	Earth and space science	General science	Earth science, HDF/HDF-EOS	Earth and space science	Earth science	Planetary astronomy
Type of Assets	Data sets, data services	Open source packages	Open source packages	Applications	Applications and source code	Metadata	Tools, binaries and source
Register User	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	★☆☆☆	☆☆☆☆
Contribute/Update Assets	★★☆☆	★★☆☆	★★☆☆	☆☆☆☆	☆☆☆☆	★★☆☆	☆☆☆☆
System Feedback	★★☆☆	★★☆☆	★★☆☆	☆☆☆☆	★★☆☆	★★☆☆	★★☆☆
Automatic Notifications	★★★★	★★☆☆	★★☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆
Discovering Assets	Hierarchy, Search	List	List	List, Filter	Hierarchy	Search	List
Register Asset Usage	☆☆☆☆	★★★★	★★★★	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆
Provide Asset Review	☆☆☆☆	★★☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆
Monitoring Feedback	★☆☆☆	★★☆☆	★★☆☆	☆☆☆☆	★☆☆☆	★☆☆☆	★☆☆☆
Secure Log In / Registration	N/A	NO	NO	NO	N/A	YES	N/A
Catalog or Repository	Catalog	Both	Both	Repository	Catalog	Catalog	Both
Operation Support	Large	Small	Small	Inactive	Small	Available	Small
Technology	RSYNC, Zope, CVS, Linux, Java, JavaServer Pages, XML, Apache, Oracle/PostgreSQL, Struts, Lucene, XSLT, Dreamweaver	PHP	JavaServer Pages	Cold Fusion	HTML	XML (WSDL), SOAP, UDDI	Cold Fusion

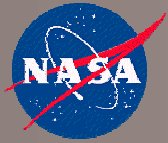
Note: Evaluations are based on how well the systems meet the reuse enablement system requirements not how well the systems perform their primary role.



NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

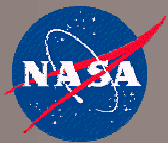
Non-NASA Systems Summary

Requirement / Feature	Open Channel / Foundation / CCOSMIC	SourceForge	Freshmeat	Scientific Applications on Linux	National Technology Transfer Center	National HPCC Software Exchange	Netlib	Savannah	Space Telescope Science Institute	Astronomical Software and Documentation Service
Domain	General	General	General	Scientific	Federal technologies (mostly NASA)	HPCC	Mathematics	General	Astronomy	Astronomy
Type of Assets	Applications and source code	Open source applications	Open source applications	Tools and packages with source code	Applications	Tools and end packages	Source codes	Tools and packages	Packages, source	Packages, source
Register User	★★★★	★★★★	★★★☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	★★★☆☆	☆☆☆☆	☆☆☆☆
Contribute/Update Assets	★★★☆☆	★★★★	★★★☆☆	☆☆☆☆	★★★☆☆	☆☆☆☆	★★★☆☆	★★★☆☆	☆☆☆☆	★★★☆☆
System Feedback	★★★☆☆	★★★☆☆	★★★☆☆	☆☆☆☆	★★★☆☆	☆☆☆☆	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆
Automatic Notifications	★★★☆☆	★★★☆☆	★★★☆☆	☆☆☆☆	★★★☆☆	☆☆☆☆	☆☆☆☆	★★★☆☆	☆☆☆☆	☆☆☆☆
Discovering Assets	List, Hierarchy, Search	Hierarchy, Search	Hierarchy, Search	Hierarchy, Search (broken)	List, Hierarchy, Search	Hierarchy, Search	Hierarchy, Search	List, Search	List, Hierarchy	List, Hierarchy, Search
Register Asset Usage	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆
Provide Asset Review	☆☆☆☆	☆☆☆☆	★★★★	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆	☆☆☆☆
Monitoring Feedback	★★★☆☆	★★★☆☆	★★★☆☆	☆☆☆☆	★★★☆☆	☆☆☆☆	★★★☆☆	★★★☆☆	★★★☆☆	★★★☆☆
Secure Log In / Registration	YES	YES	NO	N/A	N/A	N/A	N/A	YES	N/A	N/A
Catalog or Repository	Repository	Repository	Repository	Catalog	Both?	Catalog	Repository	Repository	Repository	Catalog
Operation Support	Medium	Large	Medium	Inactive	Uncertain	Inactive	Large	Large	Small	Medium
Technology	PHP, MySQL	PHP	XML-RPC	HTML, Java	ASP	Repository in a Box	HTML	Perl, PHP, MySQL	HTML	HTML



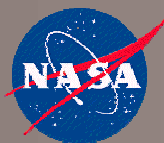
Trade Study Conclusions

- None of the existing sites fulfill the role of a software repository for the Earth science community.
- None of the systems provide the capabilities needed to function as a reuse enablement system.
- Typical shortcomings of existing systems include the following:
 - Not meeting enough of the critical functional requirements
 - Not focusing on the Earth science domain
 - Not targeting software developers as the primary audience
 - Not providing the type of small-sized assets that are most desired by the community of Earth science software developers for reuse purposes
- A new catalog/repository system is needed to encourage and better enable software reuse within the community of Earth science software developers.
- Some collaboration with existing systems may be possible, but existing systems alone cannot meet the needs of this community.



NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

Reuse Breakout Sessions

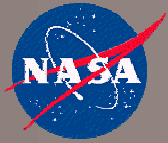


NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION
ESDS Reuse Working Group

Breakout Session

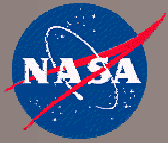
Agenda

Tuesday		Wednesday			Thursday	
25-Oct		26-Oct			27-Oct	
07:30 AM	Registration and breakfast					
08:30 AM	Welcome, logistics, speaker	08:30 AM	Joint breakout (Reuse, Infusion & Stds.)		08:30 AM	Plenary speaker
10:00 AM	Break		Break		09:45 AM	Break
10:30 AM	Working Group Summaries		Reuse breakout: reuse portal planning		10:15 AM	Reuse breakout: Planning, report back prep.
12:00 PM	Lunch with speaker					
01:30 PM	Reuse breakout: survey report, reuse enablement system	01:30 PM	Poster session	Demos (CET, metrics tool, etc.)	01:30 PM	Plenary session: report backs, wrap-up
04:00 PM						
05:00 PM					04:30 PM	



Day 1 Agenda

-
- Introduction / summary – Robert / Vic / Steve
 - Reuse survey report - Steve
 - Trade study report - Jim
 - Reuse enablement system requirements recap – Steve / Nancy
 - Review RES use cases – Steve / Nancy / All
 - RES requirements development planning - All
 - Joint breakout session planning - Shahin



Day 2 Agenda

-
- Joint breakout – Reuse, Technology Infusion, Standards
 - Reuse portal functionality - Ryan
 - Reuse portal recap
 - Reuse portal content maintenance
 - Reuse portal management - Bob
 - Content submission criteria
 - Content submission and approval process
 - Assign content management coordinators